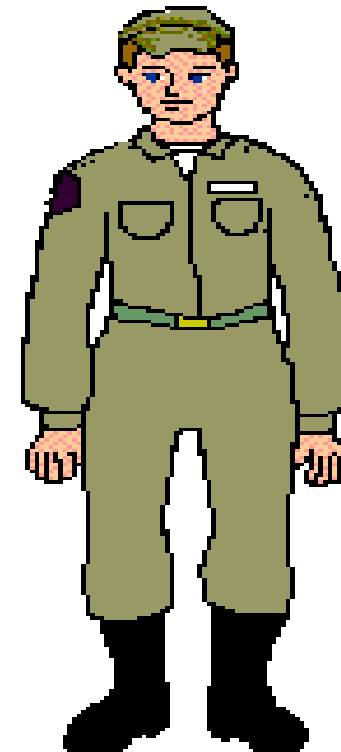




## Armed Forces College of Medicine AFCM





# **Movements of Joints of Lower Limb**

**By**  
**Prof Azza Kamal**

## Intended Learning Outcomes

- **By the end of this lecture, each student should be able to:**

- 1.List** movements of hip, knee, tibiofibular and ankle joints.
- 2.Predict** muscles producing the movements of the above mentioned joints.
- 3.Describe** clinical applications of movement of joints of the lower limb.



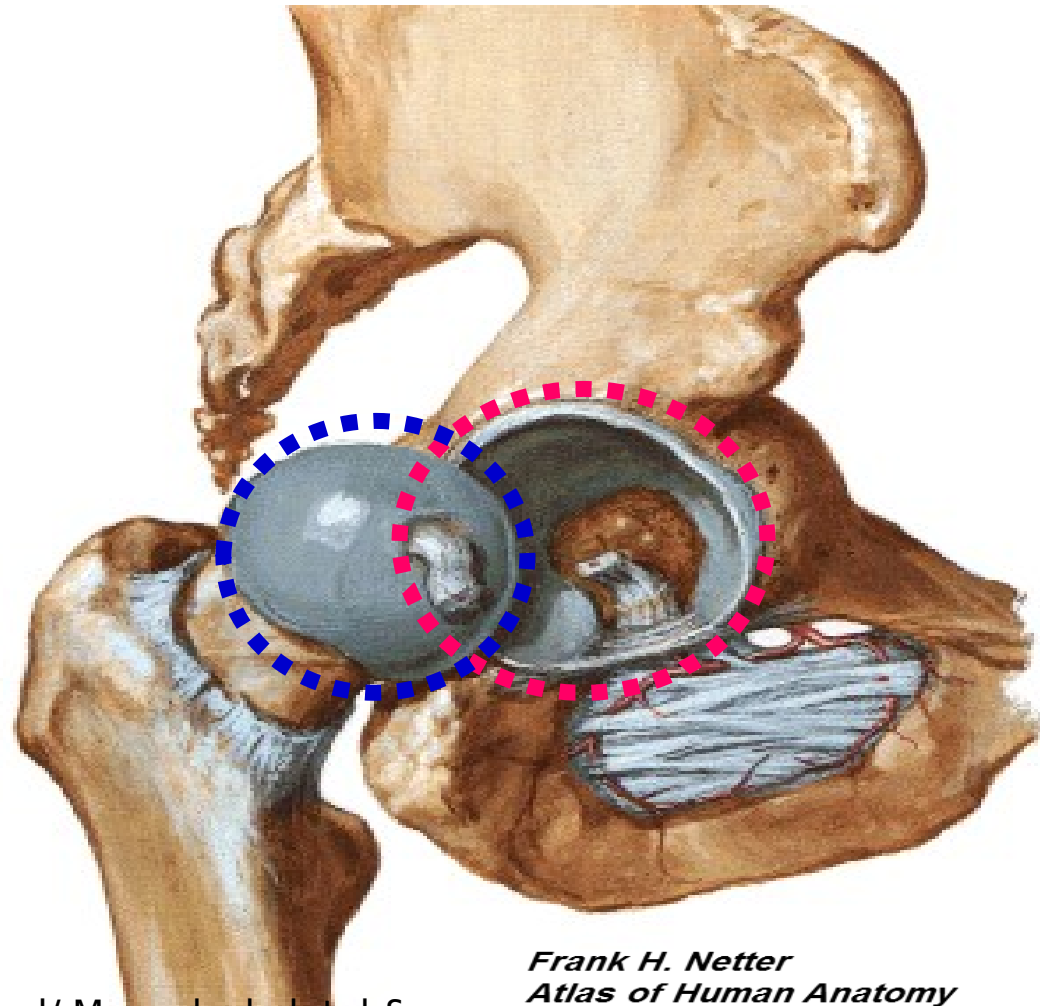
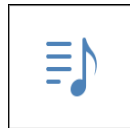
# **KEY POINTS OF THE LECTURE**

1. Movements of different joints of the lower limb
2. Muscles producing these movements
3. Relevant applied anatomy



# The Hip Joint

- **Type** : synovial ball & socket
- **Articular surfaces**:
- (1) acetabulum of hip bone
- (2) head of femur



*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

# Movements of hip joint



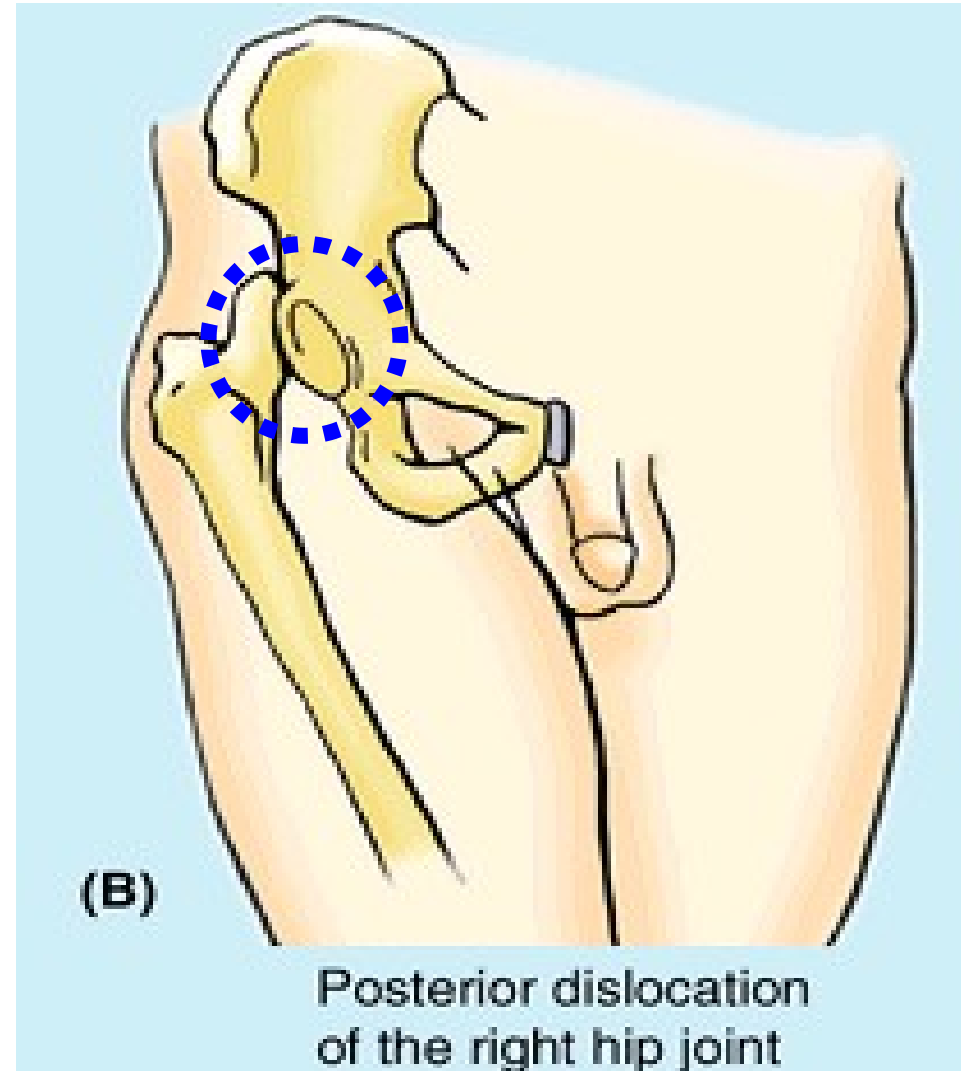
Movement	Main muscles
<b>1) Flexion</b>	<b>Muscles which lie anterior to hip joint</b> Psoas major & iliacus (iliopsoas) - most important [redacted]
<b>2) Extension</b>	<b>Muscle at back of hip+ Muscles at back of thigh</b> [redacted] gs
<b>3) Abduction</b>	<b>Muscles on lateral aspect of hip</b> [redacted] latae
<b>4) Adduction</b>	<b>Muscles on medial aspect of thigh</b> [redacted] Adductors longus, brevis & magnus + gracilis & pectineus
<b>5) Medial rotation</b>	<b>Anterior fibers of glutei medius &amp; minimus + adductors</b>
<b>6) Lateral rotation</b>	<b>6 lat rotators + gluteus maximus</b>

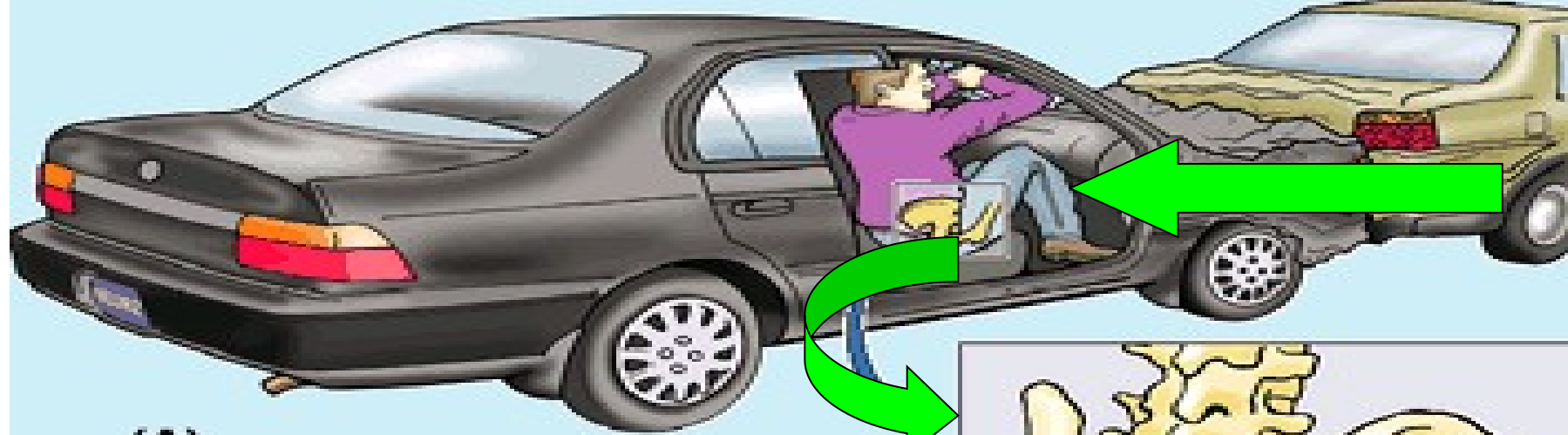


- ❑ Extensor group of muscles are more powerful than flexors.**
- ❑ Lateral rotators are more powerful than medial rotators.**

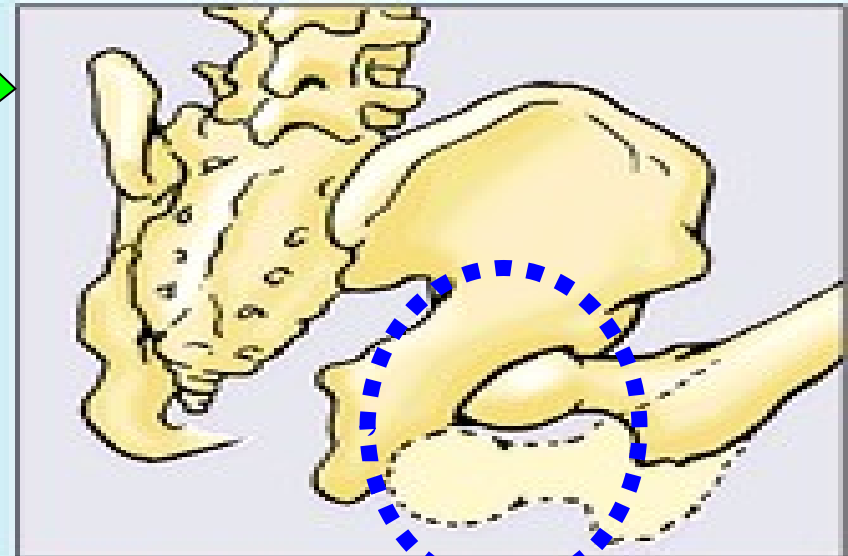
# Clinical note

- Hip could be dislocated as in car accidents, where it is usually a **posterior dislocation**  
□ sciatic nerve injury since the nerve lies **posterior to the joint**

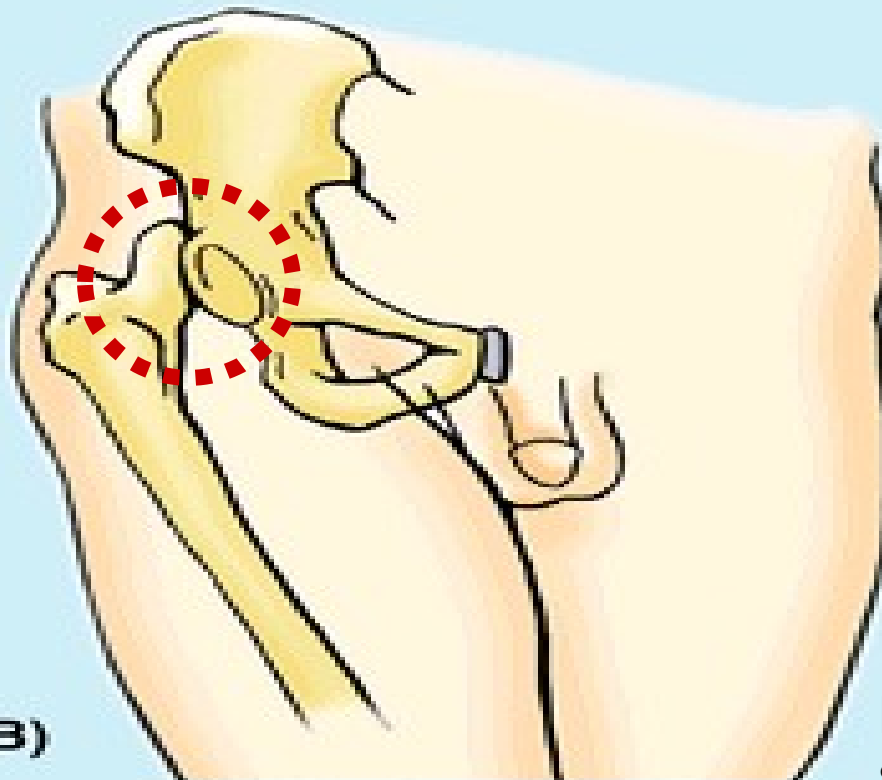




(A)



Head of femur is driven posteriorly, out of acetabulum



(B)

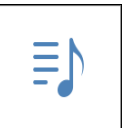
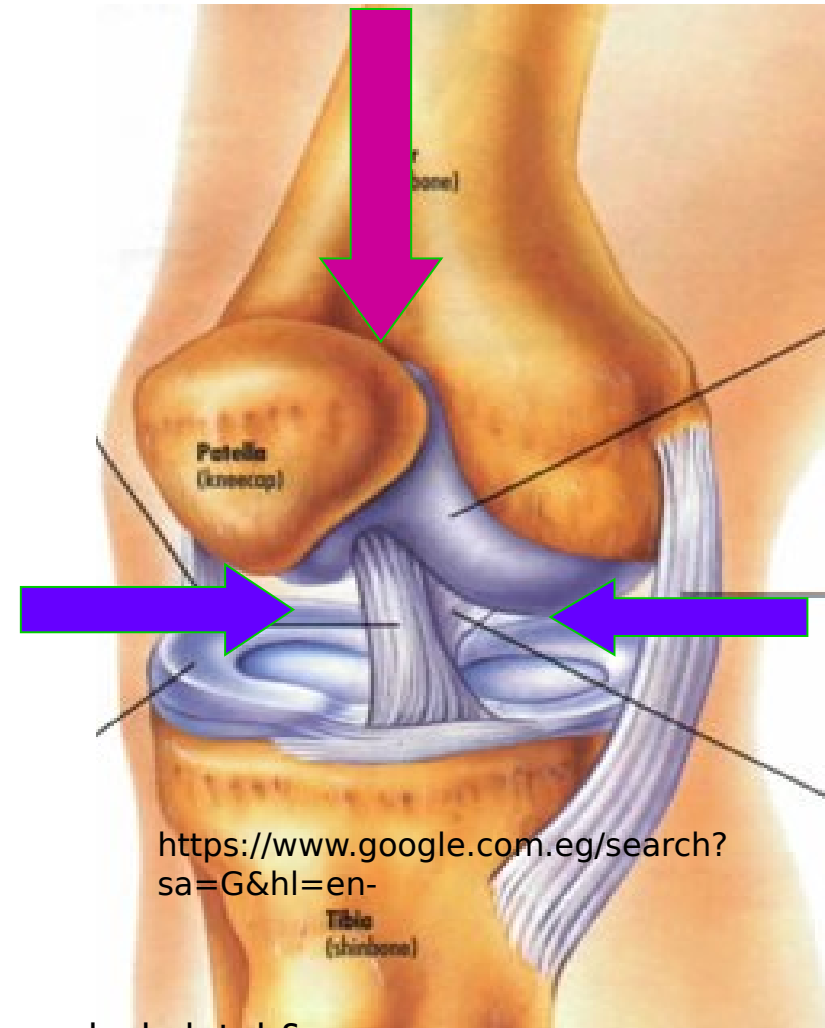
Posterior dislocation  
of the right hip joint

[https://www.google.com.eg/url?  
sa=i&source=images&cd](https://www.google.com.eg/url?sa=i&source=images&cd)



# The Knee Joint

- **Type :**
- **Synovial bicondylar**
- **Modified hinge synovial joint**
- **Compound joint: 3 bones**
  1. **femoro - patellar**
  2. **femoro- tibial**



# Movements of knee joint

## 1. Flexion

**Muscles on the back of thigh**

**hamstrings (biceps femoris & plantaris)**

## 2. Extension

**Muscles on the front of thigh**

## 3. Medial rotation semimembranosus

**Muscles inserted into upper medial surface of tibia**

**Muscle inserted into head of fibula**

## 4. Lateral rotation □ **biceps femoris**



# Locking and unlocking of the knee joint

- **Locking** of the knee is medial rotation of FEMUR on tibia at the end of extension .
- **Unlocking** of the knee is lateral rotation of FEMUR at the beginning of  produced by **popliteus**





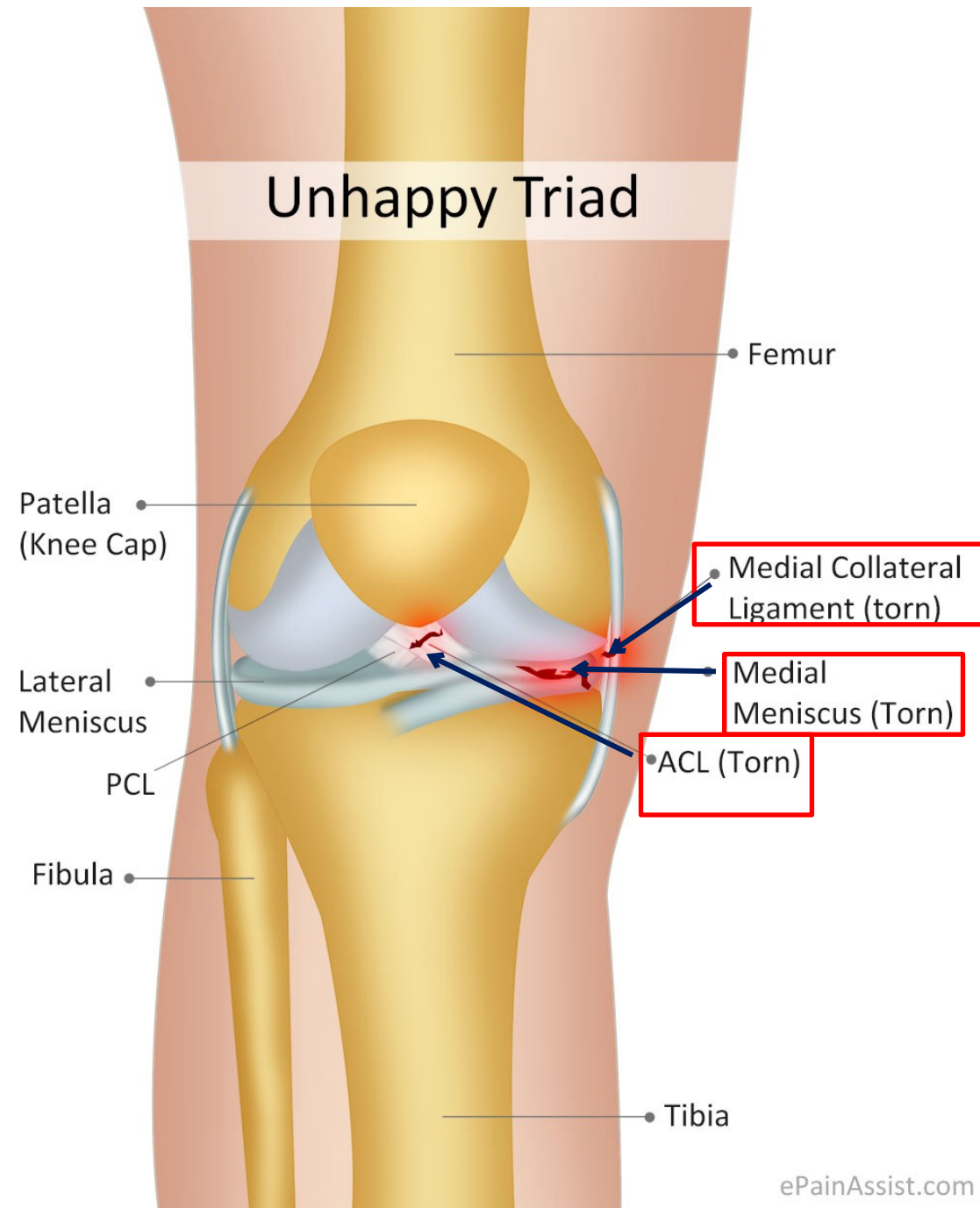
## • The Unhappy Triad 🙄

This is an injury to the knee which commonly occurs in contact sports like football when the knee is hit from the lateral side → injury to 3 structures:

1) Anterior cruciate ligament

2) Medial collateral ligament

3) Medial meniscus



Prof Azza Kama  
Integum

# Tibiofibular joints

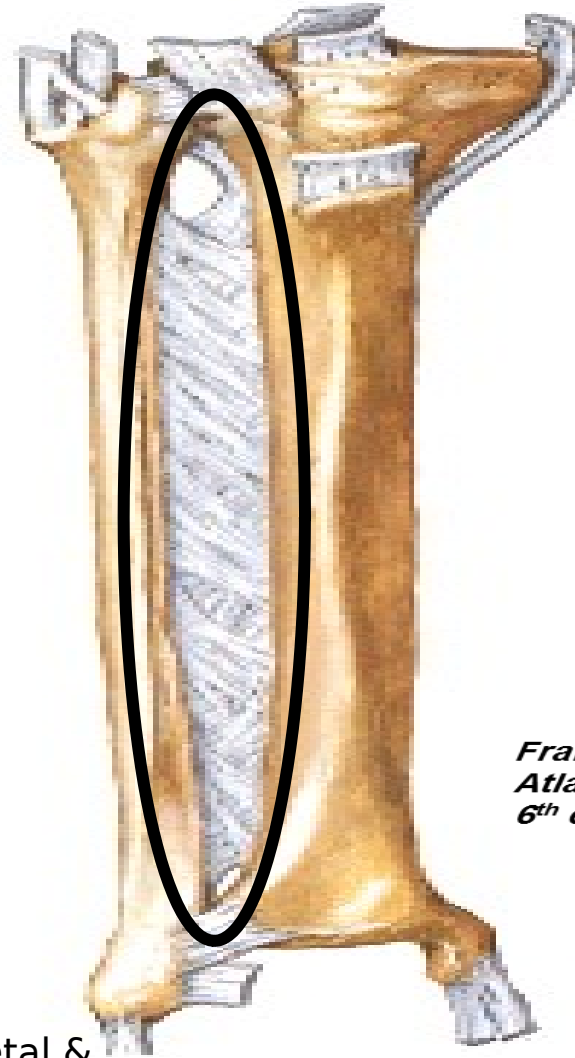
- **Superior tibiofibular joint:**
- **Plane synovial joint**
- **Head of fibula articulates with facet on inferior surface of lateral condyle of tibia**



*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

# Middle tibiofibular joints

- **Type: fibrous joint**
- **Interosseous borders of tibia and fibula connected together by interosseous membrane**



*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

# Inferior tibiofibular joint

- **Type: fibrous joint**
- **Articulating surfaces are the fibular notch of tibia & the medial side of lower end of fibula**
- **Movements of tibiofibular joints:**
- **They allow slight degree of lateral rotation of fibula during dorsiflexion of foot at ankle joint.**



*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

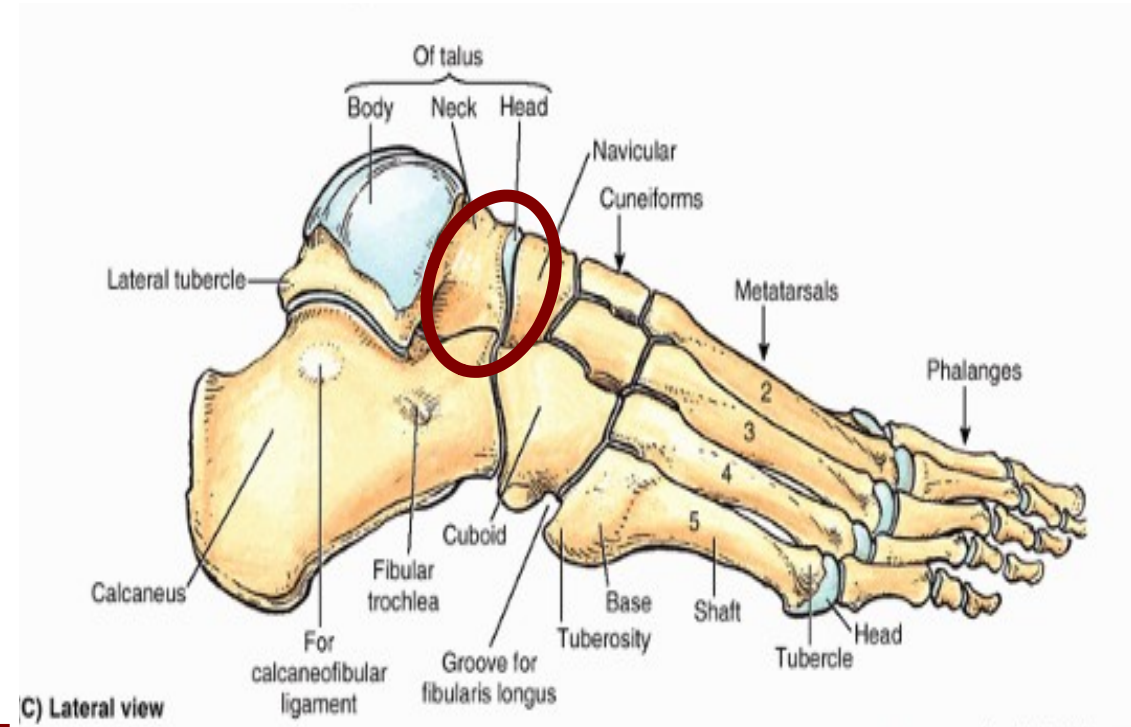


# Talocalcaneonavicular joint

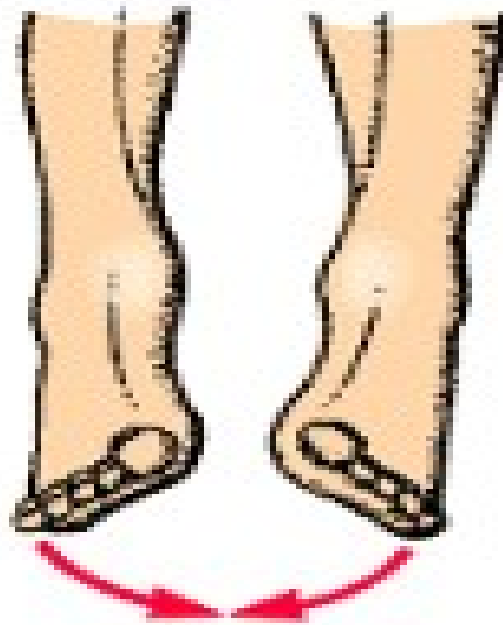
## VERY IMPORTANT



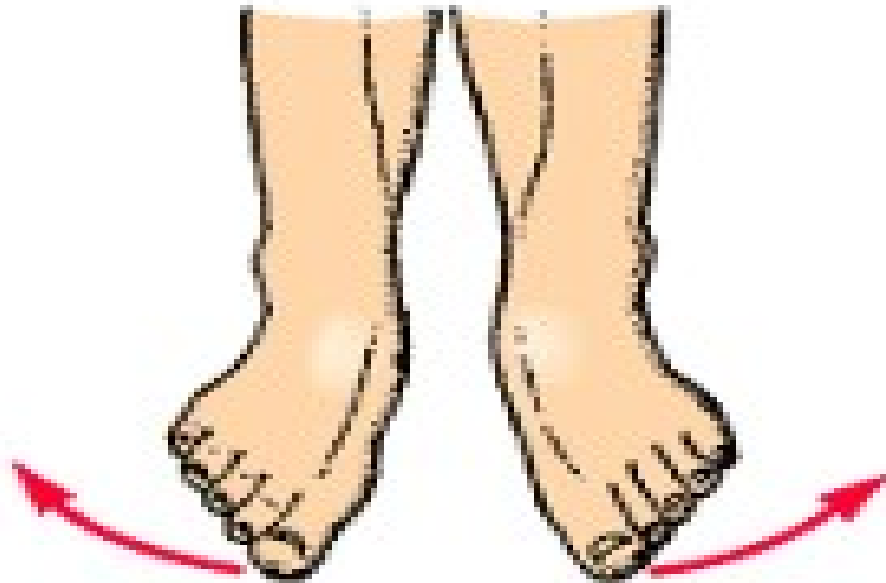
- **Type: ball & socket synovial joint**
- **Movement:**
- **Inversion of foot** □ **by tibialis anterior & tibialis posterior**
- **Eversion of foot** □ **peroneus longus, brevis & tertius**



<https://lh3.googleusercontent.com/qX5NveMHFj-i>



inversion of foot



eversion of foot

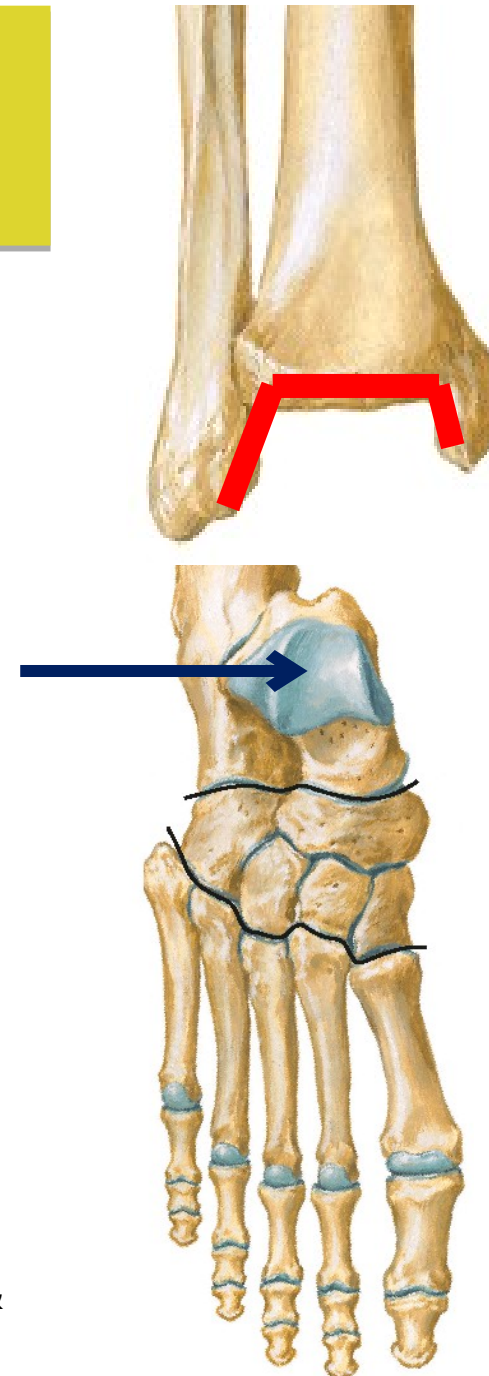
<https://lh3.googleusercontent.com/gjguO9nIPWHZP4760>

**By tibialis  
anterior &  
tibialis  
posterior**

**By peroneus  
longus, brevis &  
tertius**

# Ankle Joint

- **Type:** Synovial-hinge
- **Articular surfaces:**
  - 1- **Tibia** ( medial malleolus + inferior surface of lower end ).
  - 2- **Fibula** (lateral malleolus).  
{1 & 2 form a socket}
  - 3- **Talus fits into the socket.**



Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition

# Ankle Joint

- **Movements:**

**1) Dorsiflexion:** done by muscles of the **anterior** compartment of leg (**the ankle joint is locked in dorsiflexion** as the wider anterior border of the trochlear surface of talus becomes lodged in the socket).

**2) Plantar flexion:** done by muscles of the **posterior & lateral** compartments of leg.


( Side to side movement could be done with ankle in plantar flexion )

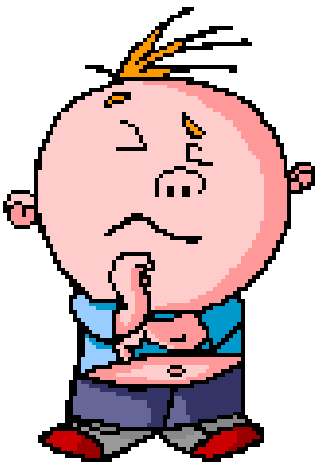


**3) Inversion & eversion are NOT done in the ankle J., but at the talo-calcaneo-navicular J.**



Match the movement in column A with the muscle producing it in column B

Column B (Muscle)	Column A (Movement)
Sartorius	Powerful flexor (s) of hip
Popliteus	Powerful extensor(s) of hip
Gluteus maximus	Flex (es) hip and knee
Glutei medius & minimus	Flex (es) hip but extend (s) knee
Iliopsoas	Unlock(s) knee joint
Rectus femoris	Prevent(s) tilting of pelvis during walking
Tibialis anterior 	Invert (s) foot
tibialis posterior	



Muscle	Movement
Iliopsoas	Powerful flexor (s)
Gluteus maximus	Powerful extensor(s)
Sartorius	Flex (es) hip and knee
	Flex (es) hip but extend (s) knee
	Unlock(s) knee joint
Glutei medius & minimus	Prevent(s) tilting of pelvis during walking
Rectus femoris	Invert (s) foot
Popliteus	





# Thank you

***:Suggested Textbook***

*Clinical Anatomy for Medical Students*

*Richard S. Snell / Third Edition*

*Pages : 600- 604*

*652- 663*

Prof Azza Kamal/ Musculoskeletal &  
Integumentary System